

## Message Text

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ACTION OES-07

INFO OCT-01 ARA-06 ISO-00 FEA-01 ACDA-07 CIAE-00

INR-07 IO-13 L-03 NSAE-00 NSC-05 EB-07 NRC-05

DODE-00 SS-15 PM-04 SP-02 /083 W

-----270911Z 061689 /21

R 261900Z MAY 77

FM AMEMBASSY BRASILIA

TO SECSTATE WASHDC 1855

INFO AMCONSUL RIO DE JANEIRO

AMCONSUL SAO PAULO

USERDA HQ WASHDC

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E.O. 11652: N/A

TAGS: TECH, PARM, BR

SUBJECT: BRAZIL'S REQUEST FOR HIGHLY ENRICHED URANIUM (HEU)

REF: (A) STATE (76) 21078; (B) BRASILIA 0938

1. SUMMARY. FOREIGN MINISTRY TRANSMITTED IN AIDE MEMOIRE OF 5/5/77 JUSTIFICATION OF CNEN FOR USE OF HEU IN IEA, SAO PAULO, RESEARCH REACTOR. ARGUMENTS ARE BASED ON RESEARCH REQUIREMENTS, PROBLEMS WITH MATRIX AND CLADDING OF LOW-ENRICHMENT FUEL, FUEL AND NEUTRON ECONOMY, FUEL BURNUP, AND FUEL ELEMENT FABRICATION PROBLEMS AND AVAILABILITY. END SUMMARY.

2. IN RESPONSE TO EMBASSY AIDE MEMOIRE OF 11/5/76, BASED ON REFTEL A, FOREIGN MINISTRY DELIVERED LONG-AWAITED RESPONSE (REFTEL B) ON 5/5/77 WITH TEXT FREELY-TRANSLATED AS FOLLOWS:

A. WITH REFERENCE TO EMBASSY'S AIDE-MEMOIRE OF NOV. 5, 1976, CONCERNING SUPPLYING FUEL ELEMENTS TO INSTITUTE OF LIMITED OFFICIAL USE

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ATOMIC ENERGY (IEA), SAO PAULO, GOB NATIONAL COMMISSION ON NUCLEAR ENERGY (CNEN) PREPARED FOLLOWING:

B. ORIGINAL PROJECT OF IEA-R1 REACTOR, OF 1956, FORESAW INTERMITTENT OPERATION AT 2MW USING AS FUEL 20 PERCENT ENRICHED U-235. IN 1964, BASED ON USAEC RECOMMENDATIONS (USAEC INFORMATIVE BULETIN, NO. 488) STUDIES WERE BEGAN

ON SUBSTITUTION OF ORIGINAL FUEL ELEMENTS BY 93.3 PERCENT ENRICHED FUEL ELEMENTS. AS CONSEQUENCE OF THIS SUGGESTION BY USG, IEA-R1 REACTOR WAS ADAPTED TO OPERATE WITH 93.3 PERCENT ENRICHED FUEL.

C. WITH OBJECTIVES OF OPERATING AT HIGHER POWER LEVEL AND ON CONTINUOUS BASIS, FOR BETTER FUEL UTILIZATION (93 PERCENT ENRICHED MTR-TYPE) SEVERAL MODIFICATIONS WERE MADE IN ORIGINAL REACTOR PROJECT. INCREASE IN REACTOR POWER MADE POSSIBLE EXECUTION OF EXPERIEMENTS IN NUCLEAR, NEUTRON, AND SOLID-STATE PHYSICS REQUIRING HIGHER FLUXED AND NEUTRON BEAMS.

D. ADVANTAGES RESULTING FROM USE OF HIGHLY-ENRICHED FUEL ELEMENTS ARE WELL KNOWN. THEY WERE WIDELY DEMONSTRATED IN MORE THAN 24 US, USSR, AND UK REACTORS USED FOR RESEARCH AND MATERIALS TESTING.

E. USE OF LOW ENRICHMENT FUEL (20 PERCENT FOR EXAMPLE) REQUIRES HIGHER PROPORTION OF URANIUM IN ALUMINIM-URANIUM ALLOY MTR-TYPE FUEL ELEMENTS. THIS HIGHER PERCENTAGE OF URANIUM, WHICH CAN REACH 48 PERCENT, MAKES ALLOY MORE FRAGILE, CONTRIBUTING TO REJECTION OF MANY ELEMENTS AND TO INCREASE IN FABRICATING COSTS.

F. PRESENCE OF HIGHLY-ENRICHED URANIUM IN CORE RESULTS IN DECREASE IN THE NEUTRONS CAPTURE BY U-238, BETTER NEUTRON ECONOMY, AND SMALLER CRITICAL MASS, PRODUCING INVESTMENT SAVINGS.

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G. IN HIGHLY-ENRICHED FUEL ELEMENTS CLADDING THICKNESS CAN BE UP TO 0,5 MM, REDUCING CORROSION. CLADDING RUPTURE PROBLEMS ARE ALSO LESS SERIOUS BECAUSE OF MORE DILUTE URANIUM-ALUMINIUM ALLOY MTRIX OF ELEMENTS. CONSEQUENTLY RADIOACTIVE CONTAMINATION OF COOLING POOL WATER IS LESS SERIOUS.

H. ANOTHER ADVANTAGE OF USE OF HIGHLY-ENRICHED URANIUM RESULTS FROM POSSIBILITY OF GREATER FUEL BURNUP-EG, EXPERIMENTAL DATA FROM "SILOE" REACTOR DEMONSTRATED BURNUP POSSIBILITY OF UP TO 30 PERCENT, RESULTING IN LARGE FUEL AND NEUTRON ECONOMIES (FACTOR OF 3 TO 5).

I. ACCORDING TO INFORMATION FROM BABCOCK & WILCOX CO., TRANSMITTED TO IEA IN 1965, ABOUT 25PERCENT OF 20 PERCENT-ENRICHED FUEL ELEMENTS WERE REJECTED DURING PROCESS OF FABRICATION. COMPANIES FABRICATING FUEL ELEMENTS DO NOT ADVISE PRODUCTION OF LOW ENRICHMENT ELEMENTS AND HAVE CEASED THEIR FABRICATION.

J. BASED ON THESE ARGUMENTS, CNEN CONSIDERS IMPRACTICABLE  
OPERATION OF REACTORS IEA-R1 WITH 20 PERCENT ENRICHED FUEL IN  
PRESENT SITUATION.

3. IN DISCUSSIONS WITH SCICOUN, CNEN AND FONMIN  
REPRESENTATIVES ADDED THAT UNIQUE ROLE IN BRAZIL FOR IEA-R1 IS  
BASED ON EMPLOYMENT OF HEU FUEL - WITH 20 PERCENT-ENRICHED  
FUEL, IEA-R1 CAPABILITIES ARE DUPLICATED  
BY OTHER BRAZILIAN RESEARCH REACTORS.

4. FYI: CNEN ADVISED SCICOUN THAT US NUCLEAR CO.,  
WHICH HAS CNEN CONTRACT TO FABRICATE IEA HIGHLY-ENRICHED  
FUEL ELEMENTS, MAY BE GOING OUT OF THIS BUSINESS. CNEN  
GREATLY CONCERNED OVER POSSIBILITY SINCE ISSUE OF IEA FUEL  
ELEMENTS HAS BEEN DRAGGING ON SINCE 1974.  
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## Message Attributes

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**Disposition Date:** 22 May 2009  
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**Type:** TE  
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**Review Markings:**  
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